

REMARKS/ARGUMENTS

Introductory Comments

Reconsideration of this application is respectfully requested. Claims 31-57 are currently pending and stand rejected in the application.

Any reference to the "Office Action" herein refers to the office action dated May 26, 2005 unless otherwise noted.

Rejections Under 35 U.S.C. § 102(e)

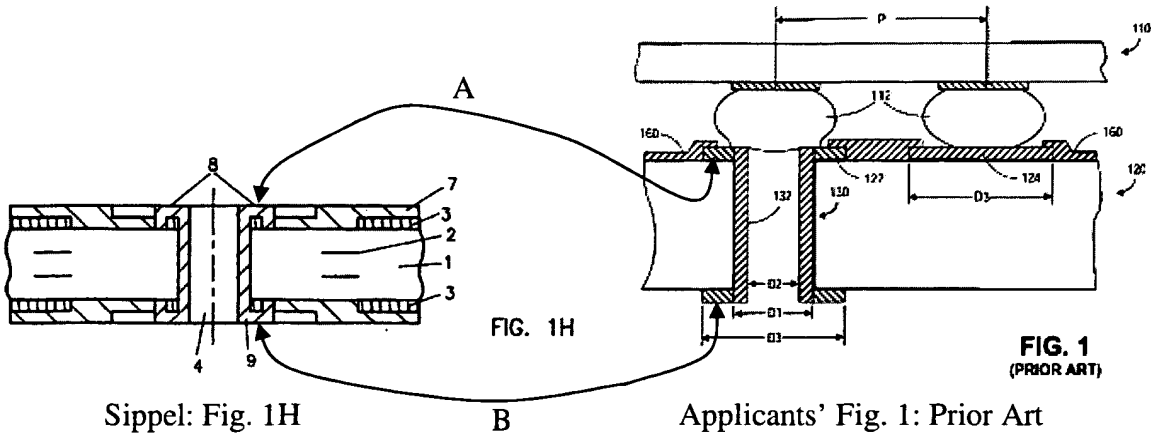
In the office action dated May 19, 2006, claims 31, 32, 36, 37, 47, 48, 58, 59 and 61 stand rejected under 35 U.S.C. §102(b) as anticipated by US 5,680,701 (Sippel). The office action asserts that Sippel discloses, among others, applicants' recited claim limitation of "at least one padless via". Applicants respectfully disagree with the assertion, as Sippel clearly and explicitly describes vias with pads/lands in all embodiments, as well as showing them in the figures depicting the structure of each variant (embodiment).

For example, with regard to the embodiment depicted in Figs. 1A-1H, Sippel describes:

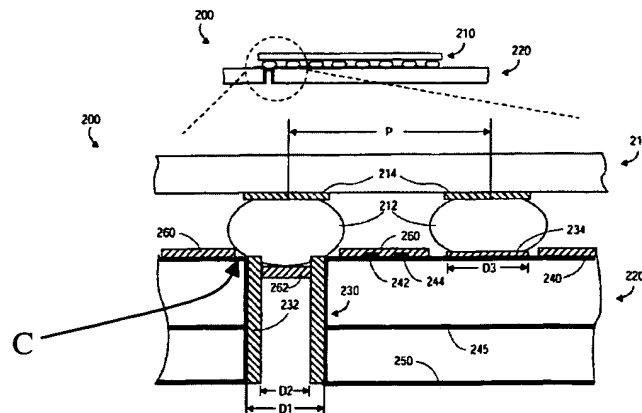
Above and around the holes 4, photoresist 6 is retained and in the remaining regions of the substrate surface it defines the future conductors, (col. 3, lines 8-10). As a result, the conductor structures are transferred to the metal foil 3 and the contact areas, such as *lands* (annular contact areas surrounding the holes) and *pads* (contact areas without holes), are formed on the metal foil 3, (col. 3, lines 17-20) (emphasis added).

In step g), a solder stop mask 7 is applied to the surface of substrate 1, exposed and developed, removing the solder stop mask in particular above the holes 4 as well as around them in a region 8 comprising at least the metal foil retained there *for forming a land*, (col. 3, lines 21-25).

Fig. 1H of Sippel clearly shows ‘metallization 9’ as an annular ring surrounding the via 4, and Sippel defines this as “lands (annular contact areas surrounding the holes)”.



The ‘metallization 9’ (lands) of Sippel are structurally and functionally equivalent to the structures 122 identified as ‘contact pads’ in applicants’ Prior Art Fig. 1 (see arrows ‘A’ and ‘B’ added above to indicate equivalent structures), and that the difference between Sippel’s ‘lands’, and applicants’ prior art ‘contact pads’ is purely semantic. Applicants distinguish padless vias in that padless vias do not have contact pads 122 (‘lands’, ‘annular rings’, ‘metallization’) surrounding them (as indicated by arrow ‘C’ added below), unlike Sippel and unlike applicants’ prior art Fig. 1.



Sippel fails throughout to disclose applicant's recited "at least one padless via". Therefore, Sippel explicitly describes forming lands and pads, and clearly depicts a pad surrounding the via in Fig. 1H, and Sibbel fails to disclose "at least one padless via" with regard to the 'first process variant'.

With regard to the embodiment depicted in Figs. 2a-2H, Sibbel again explicitly describes and shows that the vias are not 'padless vias'. Sibbel describes:

Accurate registration must be ensured in several process steps, namely, during the fabrication of the conductors which have to be registered relative to the inner layers 2 through holes 4 and when the solder stop mask is bared relative to the position of the holes, *pads*, etc., (col. 4, lines 11-15) (emphasis added).

Further, as in Fig. 1H, Fig. 2H also clearly shows pads 9 surrounding the via 4, identifying the via 4 as a padded via, not a 'padless via'. Therefore, the 'second process variant' of Sibbel also fails to disclose at least applicants recited claim limitation of "at least one padless via".

With regard to the embodiment depicted in Figs. 3a-3H, Sibbel explicitly describes and shows that the vias are not 'padless vias'. Sibbel describes:

"[t]here is no double layer of metal foil 3 and deposited metallization 9 in the region 8 surrounding the edges of the holes but only metallization 9. This process allows producing all contact faces, such as *lands* and *pads*, in metallization step h), (col. 4, lines 27-32).

Sibbel also clearly describes, with respect to the third process variant, "Compared with the second variant, variant 3 has the advantage that there is no registration problem when the solder stop mask is bared for the lands", (col. 4, lines 36-38).

Further, as in Figs. 1H and 2H, Fig. 3H also clearly shows pads 9 surrounding the via 4, identifying the via as a padded via, not a 'padless via'. Therefore, the 'third process

variant' of Sibbel also fails to disclose at least applicants recited claim limitation of "at least one padless via".

Applicants respectfully submit that Sibbel clearly and explicitly describes and depicts padded vias, not padless, in each embodiment, therefore failing to disclose at least applicant's recited claim limitation of "at least one padless via". Although Sibbel asserts, "It is also suitable for what is known as a 'landless design', *for connecting the conductive material of the holes 4 directly to the conductors*", (col. 4, lines 32-35), the stated 'landless design' appears unrelated to applicant's "at least one padless via". This can be determined easily from Sibbel's explicit descriptions. Sibbel describes here that in a landless design, the conductive material of the holes 4 (vias) are connected directly to the *conductors*. Sibbel also clarifies throughout the description that the conductors are lands and/or pads.

Above and around the holes 4, photoresist 6 is retained and in the remaining regions of the substrate surface it defines the *future conductors*, (col. 3, lines 8-10). As a result, the *conductor structures* are transferred to the metal foil 3 and the contact areas, *such as lands* (annular contact areas surrounding the holes) *and pads* (contact areas without holes), are formed on the metal foil 3, (col. 3, lines 17-20) (emphasis added).

Therefore, although Sibbel fails to describe a 'landless design' in detail, Sibbel does clearly describe that the vias in a 'landless design' are connected directly to the lands and/or pads (conductors) (col. 4, lines 32-35), so the vias of a 'landless design' are padded vias, not 'padless vias'. Nothing described in Sibbel refutes this interpretation.

For at least the reasons provide above, applicants respectfully submit that Sibbel fails to disclose at least applicants' claim limitation of "at least one padless via" recited in independent claims 31, 36 and 47, and therefore fails to provide proper basis for the 35 U.S.C. §102(b) rejections of these claims. Applicants therefore respectfully request

withdrawal of the 35 U.S.C. §102(b) of these claims, and of claims 32 and 58, 37 and 59, and 48 and 61, which depend from and include the distinguishing limitations of independent claims 31, 36, and 47, respectively.

Rejections Under 35 U.S.C. § 103(a)

Claims 35, 41-44, 46 and 60

In the office action, claims 35, 41-44, 46 and 60 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Sippel, et al., in view of US 5,418, 689 (Alpaugh). Applicants contend that the rejections are improper because the prior art reference (or references when combined) fail to teach or suggest all the claim limitations, and therefore fail to establish a prima facie case of obviousness.

The office action asserts that Sippel discloses the claimed invention with respect to claim 35, except that,

Sippel does not specifically disclose a component attached to the PCB by a solder interconnection between a contact pad on a bottom surface of the component and the at least one padless via [claim 35]. However, it is well known in the art to attach components to PCB in this manner to vias as evidenced by Alpaugh (see col. 4, 50-65). Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to attach a chip to the PCB in the invention of Sippel, (office action, page 4, last paragraph).

The office action also asserts that Sippel discloses applicants' claim 41 except that,

"Sippel does not specifically disclose a component attached to the PCB by a plurality of solder ball interconnections between the array of interconnections formed on the first surface of the PCB and a corresponding array of contact pads disposed on a bottom surface of the electronic component [claim 41]. However, it is well known in the art to attach components to PCB in this manner to vias as evidenced by Alpaugh (see col. 4, 50-65). Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to attach a chip to the PCB in the invention of Sippel, (office action page 5, first paragraph).

The office action appears to assert that the disclosure in Bhatt as modified by Alpaugh to render obvious applicants' claim 41, would also render obvious claims 42-43, 46, 52, and 60, (office action, page 6, paragraph 2), and that "it would have been obvious to one having ordinary skill in the art at the time of the invention to make the width [of the traces] 3 mils, (office action, page 7, paragraph 2).

All of these asserted 35 USC 103 rejections relying on the combination of Sippel with Alpaugh must fail as improper, for, as discussed above regarding the asserted 35 USC 102(b) rejection, Sippel fails to disclose at least applicants' recited claim limitation of, "at least one padless via" in independent claim 31 from which claim 35 depends, and in independent claim 41 from which claims 42-43, 46 and 60 depend. Alpaugh also fails to disclose this limitation, and so the combination of Bhatt and Alpaugh fails to establish a prima facie case of obviousness as required for a proper 35 USC 103(a) rejection.

The argument presented in the middle of page 6 of the office action, regarding claim 44, likewise fails. Sippel fails to disclose applicants' claim limitation of "at least one padless via" recited in claim 41, from which claim 44 depends, and the recited claim limitation of "at least one padless via" does not involve merely discovering an optimum or workable range. Therefore, no prima facie case of obviousness is established with regard to claim 44, which includes the limitations of independent claim 41, and the 35 USC 103 rejection of claim 44 is improper.

Claims 39-40

The office action asserts claims 39 and 40 are unpatentable under 35 U.S.C. §103(a) over Sippel in view of US 6,555,208 (Takada). Applicants contend that the rejections are improper due to the failure to make out a prima facie case for obviousness.

The office action states that Sippel discloses applicants claimed invention except that the office action relies upon Takada to provide disclosures absent from Sippel that a “contact pad has a diameter of less than 18 mils [claim 39]”, (office action, page 6, last paragraph), and that a “padless via has a diameter of 12 mils or less [claim 40]”, (office action, page 8, paragraph 2). However, as discussed above, Sippel also fails to disclose applicants recited claim limitation of “at least one *padless via*” in independent claim 36 from which claims 39 and 40 depend. As fully explained in the preliminary amendment submitted October 14, 2005, Takada utterly fails to disclose padless vias, but rather discloses vias with pads in every embodiment. Therefore, the combination of Sippel with Takada likewise fails to disclose “at least one *padless via* extending from the *first signal routing layer* to the at least one electrically conductive layer”, and therefore also fails to establish a prima facie case of obviousness as required for a proper 35 USC 103(a) rejection.

Claim 45

The office action asserts claim 45 is unpatentable under 35 U.S.C. §103(a) over Sippel in view of Alpaugh as applied to claim 41, and further in view of Takada, incorrectly asserting as above that the combination of Sippel with Alpaugh discloses applicants’ recited independent claim 41 except that the combination fails to disclose a

contact pad with a diameter of less than 18 mils, further asserting that Takada supplies this disclosure.

For all the reasons already articulated in the above sections, applicants contend that the rejections are improper due to the failure to make out a prima facie case for obviousness in as much as the cited references, both alone and in combination, fail to disclose at least applicants' claim limitation of "at least one padless via" recited in independent claim 41 from which claim 45 depends. Therefore, as above, applicants also contend that the cited references fail to establish a prima facie case of obviousness as required for a proper 35 USC 103(a) rejection as regarding claim 45.

Claims 54-57 and 62

The office action asserts claims 54-57 and 62 are unpatentable under 35 U.S.C. §103(a) over US 6,521,846 (Freda) in view of Sippel. Applicants contend that the rejections are improper due to the failure to make out a prima facie case for obviousness.

The office action asserts that Freda discloses "a method . . . comprising at least one via (22) extending from a first signal routing layer on the first surface of the PCB to an electrically conductive layer (24)", and admits "Freda does not specifically state that the via is padless [claim 54]", but then incorrectly asserts "it is well known in the art to use padless vias in PCB as evidenced by Sippel (col., 4, lines 30-40)", (office action, page 8, last paragraph). However, as argued and demonstrated regarding the asserted 35 USC 102(b) rejection above, Sippel completely fails to disclose padless vias, so Sippel completely fails to supply the asserted teaching admitted in the office action to also be missing from Freda.

As such, the combination of Freda with Sippel fails to disclose at least applicants' claim limitation of "at least one padless via" recited in independent claim 54. Likewise, the combination of Freda with Sippel fail to disclose applicants' claims 55-57 and claim 62 which depend from and include the limitations recited in independent claim 54. Therefore, applicants respectfully submit that the office action fails to meet the requirements to establish a prima facie case of obviousness under 35 USC 103(a).

Claims 33, 34, 38, and 49-51

Claims 33, 34, 38, and 49-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sippel in view of US 2001/0009066 A1 (Bhatt). The office action incorrectly asserts that Sippel discloses the claimed invention except that Sippel does not specifically disclose a via plug formed within the padless via, that the via plug is formed of an electrically conductive materials (with regard to claims 34, 38, 51), or that forming an array of interconnections on the first surface of the PCB comprises forming an array of interconnection having an array pitch of 0.8mm or less (with regard to claim 49). The office action further asserts that Bhatt supplies these disclosures missing from Sippel.

However, as argued and demonstrated regarding the asserted 35 USC 102(b) rejection above, Sippel completely fails to disclose padless vias, and as argued in prior responses, Bhatt also completely fails to disclose padless vias. As such, the combined references also completely fail to disclose or render obvious at least applicants' limitation of "at least one padless via" recited in independent claims 32, 36, and 47. Because claims 33-34, 38, and 49-51 depend from and include the claim limitations of independent claims 32, 36, and 47, respectively, applicants respectfully submit that

claims 33-34, 38, and 49-51 are patentable over the combined references, and request withdrawal of the 35 USC 103(a) rejections of these claims.

Summary of Arguments Regarding 35 USC 103(a) Rejections

As pointed out regarding the asserted 35 USC 103(a) rejections in each of the foregoing discussions, the combined references cited in the office action fail to meet the requirements for establishing a proper 35 USC 103(a) rejection, in as much as the cited references fail, both alone and in combination, to disclose at least one claim limitation in each of applicants' the identified claims.

Therefore, applicants' respectfully request withdrawal of the 35 USC 103(a) rejections from each of claims rejected in the office action under 35 USC 103(a).

CONCLUSION

In light of the points and arguments set forth herein, applicants respectfully submit that the rejections have been properly overcome, and the claims are allowable as they stand.

Please charge any shortages and credit any overages to Deposit Account No. 02-2666.

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Respectfully submitted,


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